

BEST AVAILABLE COPY**REMARKS**

New Claims 24 and 25 have been added. Support for the subject matter of new Claims 24 and 25 may be found in the substitute specification, for example, at page 35, lines 3-10.

In the Office Action mailed March 21, 2004, the abstract has been objected to for not being on a separate sheet. The specification has been amended to include a separate sheet containing the abstract. Withdrawal of the objection to the specification is respectfully requested.

Claims 3-6 and 19-23 have been objected to as improperly dependent. Claims 1 and 17 have been amended to recite that the nucleotide incorporation is determined quantitatively, and Claims 3 and 19 have been cancelled without prejudice. Claims 4 and 20 have been amended to correct dependencies. Claim 9 is objected to as allegedly failing to further limit Claim 8. The Examiner has noted that Claim 1, upon which Claim 8 depends, has the limitation of a primer extension reaction. Applicant submits that Claim 9 refers to a primer extension reaction before pooling, and is distinct from the primer extension reaction recited in Claim 1. Claim 9 has been amended to clarify this distinction. Withdrawal of the objection to Claims 3-6, 9 and 19-23 is respectfully requested.

Claims 1, 3, 17 and 19 have been rejected under 35 U.S.C. § 102(b) as allegedly anticipated by U.S. Patent No. 6,020,137 to Lapidus et al. ("Lapidus et al."). The Examiner has alleged that Lapidus et al. teach a method for detecting loss of heterozygosity in a pooled patient population comprising: pooling samples; hybridizing probes to the sample which are immediately adjacent to a single base polymorphism; exposing the pooled samples to a plurality of different dideoxynucleotides; washing the sample; determining which of the dideoxynucleotides are incorporated into the probes; and detecting the incorporated dideoxynucleotide at the site.

Applicant respectfully submits that Lapidus et al. fail to teach every element of the claimed invention, and therefore fail to anticipate the subject matter of Claims 1, 3, 17 and 19. The methods of Claims 1 and 17 require the step of "sequentially adding nucleotides to the

reaction mixture and determining the incorporation or non-incorporation of each nucleotide as each nucleotide is added.” Lapidus et al. do not teach or suggest this step of sequential nucleotide addition and real-time detection of incorporation. Rather, Lapidus et al. disclose a method in which at least two dideoxynucleotides are added simultaneously. Lapidus et al. at Col. 5, lines 49-56. Accordingly, Lapidus et al. fail to anticipate the present invention.

In addition, the nucleotides that are sequentially added in the method of the present invention are non-chain terminating nucleotides. The method of Lapidus et al. utilizes chain terminating dideoxynucleotides. Lapidus et al. fail to disclose a method in which non-chain terminating nucleotides are sequentially added, and incorporation or non-incorporation is determined as each nucleotide is added. Accordingly, withdrawal of the rejection of Claims 1, 3, 17 and 19 under 35 U.S.C. § 102(b) is respectfully requested.

Claims 4-7 and 20-23 have been rejected under 35 U.S.C. § 103(a) as allegedly rendered obvious by WO98/28440 to Nyren et al. (“Nyren-2”) in view of Lapidus et al. The Examiner has alleged that Nyren-2 teaches a method of sequencing DNA based on the detection of release of pyrophosphate. Further, the Examiner has alleged, Nyren-2 teaches a method of identifying a base at a target position using an extension primer that hybridizes immediately adjacent to the target position, wherein deoxynucleotides are added, and incorporation is detected by the release of pyrophosphate. It would have been obvious, the Examiner has alleged, to modify the method of Nyren-2 by pooling the nucleic acids as taught by Lapidus et al.

Applicant respectfully submits that there would have been no motivation to combine Nyren-2 with Lapidus et al. Nyren-2 teaches only a method of sequencing DNA, and thus one would have been motivated to use a homogenous nucleic acid sample, or a heterozygous sample from a single individual, in such a method, not a pooled sample. Nyren-2 does not teach or suggest that the method disclosed therein would be useful for any purpose other than sequencing and sequencing-related applications such as the detection of single base changes.

As motivation to combine the references, the Examiner points to the uses of pooled samples disclosed by Lapidus et al. at Col. 4, lines 35-40. However, the mere fact that pooled samples have certain uses does not provide motivation to use pooled samples in the method of Nyren-2. To the contrary, one would have expected that the method of Nyren-2 would be

suitable only for a homozygous sample or a heterozygous sample from a single individual. See Nyren-2 at page 18, lines 13-27.

In addition, it was known at the time of filing of the present application that the detection of genetic changes such as SNPs or loss of heterozygosity in pooled samples requires DNA methods capable of highly accurate and quantitative analysis. For example, Lapidus et al. disclose that "it is important to count the number of molecules in order to provide a statistical analysis of the likelihood of loss of heterozygosity." Col. 12, lines 28-34. Lapidus et al. also teach that statistically significant differences between relative proportions of the respective nucleic acids being compared need to be determined (Col. 6, lines 23-31; Col. 8, lines 2-4.)

Thus allele frequency determination requires a method that has high detection sensitivity and specificity. Many methods of sequencing or base detection are not sufficiently reliable or consistent, or do not provide sufficiently quantitative discrimination on a pooled sample. For example, methods such as traditional Sanger sequencing are not sufficiently accurate and quantitative for such a determination. Nyren-2 simply provides another method of sequencing DNA, and there is no indication that such a method would be quantitative enough for use in allele frequency determination using pooled samples. Accordingly, one would not have been motivated to use the sequencing method of Nyren-2 in a pooling application that requires a much more detailed and accurate quantification. Nor would one have had a reasonable expectation of success in achieving the requisite level of quantitation using the method of Nyren-2 with pooled samples.

It is only in accordance with the present invention that it was surprisingly discovered that a bioluminetic pyrophosphate method was quantitative enough to accurately detect allele frequencies in pools of samples. As disclosed in the substitute specification at page 37, lines 8-15, the correlation between peak heights and allele frequencies has been shown to be "excellent," and the accuracy of the results obtained "surprisingly high." It is impermissible now, with the benefit of hindsight and applicant's invention, to pick and choose elements of the cited references when one of ordinary skill in the art would not have been motivated to combine the elements.

Even if one of ordinary skill in the art had been motivated to combine Nyren-2 and Lapidus et al., the combination thereof fails to achieve the present invention. The references, alone or in combination, fail to teach a step of determining the frequency of an allele from a pattern of nucleotide incorporation. Lapidus et al. do not determine frequency of an allele, but rather measure dideoxynucleotide incorporation to determine whether normal heterozygosity has been lost by deletion. Lapidus et al. at Col. 5, lines 61-67. Accordingly, the combination of Nyren-2 and Lapidus et al. fails to render the present invention obvious.

In view of the foregoing comments and amendments withdrawal of the rejection of Claims 4-7 and 20-23 under 35 U.S.C. § 103(a) is respectfully requested.

Claims 8-11, 14 and 15 have been rejected under 35 U.S.C. § 103(a) as allegedly rendered obvious by Lapidus et al. in view of Breen et al. (March 2000) BioTechniques 28:464 (“Breen et al.”). As discussed hereinabove, Lapidus et al. fail to teach or suggest the step of sequential addition of non-chain terminating nucleotides. Breen et al. fail to remedy this deficiency, and thus the combination of references fails to render the present invention obvious.

Submitted herewith is the Declaration under 37 C.F.R. § 1.132 of inventor Anna Sylvan evidencing a date of invention prior to the publication date of Breen et al. Accordingly, withdrawal of the rejection under 35 U.S.C. § 103(a) over Lapidus et al. in view of Breen et al. is respectfully requested.

Claims 8-15 have been rejected under 35 U.S.C. § 103(a) as allegedly rendered obvious by Lapidus et al. in view of Germer et al. (2000) Genome Research 10:258 (“Germer et al.”). The Examiner has alleged that it would have been obvious to modify the method of Lapidus et al. with the teachings of Germer et al. that concentrations of samples should be ensured and that using the same concentration of each DNA sample is important. Germer et al. do not teach adjusting the amount of nucleic acids to substantially the same amount, but the Examiner has alleged that such an adjustment would have been obvious.

As discussed hereinabove, Lapidus et al. fails to teach or suggest the step of sequentially adding non-chain terminating nucleotides. Germer et al. fail to remedy this deficiency, and thus the combination of Lapidus et al. and Germer et al. fails to render obvious the present invention. Further, Germer et al. simply does not teach or suggest a step of adjusting the concentration of

nucleic acids in each sample of the population which is pooled. The test proposed by Germer et al. only shows whether the method as a whole gives accurate enough measurement on the pool. It does not show how an individual sample deviates, or which samples will require adjustment prior to pooling. Further, Table I of Germer et al. shows the general accuracy of the method, and that the data is linear over all tested frequencies. It does not, however, serve to construct a calibration curve, and cannot be used for DNA calibration, as it does not provide information on individual samples.

Accordingly, the present invention is not rendered obvious by Lapidus et al. in view of Germer et al., and withdrawal of the rejection under 35 U.S.C. § 103(a) is respectfully requested.

In view of the foregoing comments and amendments, it is respectfully submitted that the present application is in condition for allowance.

Entry of the present amendment, and favorable consideration and allowance of all pending claims is earnestly solicited.

Respectfully submitted,

DORSEY & WHITNEY LLP

Date: August 26, 2004



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DOCKET 14255.01

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Anna Sylvan	
Application No.:	10/085,774	
Filing Date:	February 27, 2002	Examiner:
Title:	METHOD FOR DETERMINING ALLELE FREQUENCIES	Group Art Unit:

DECLARATION UNDER 37 CFR § 1.131

I, ANNA SYLVAN, hereby declare as follows:

1. I am the sole inventor of the invention disclosed and claimed in U.S. Patent Application Serial No. 10/085,774 filed February 27, 2002, which claims priority under 35 U.S.C. § 119(e) from U.S. Patent Application Serial No. 60/271,703 filed February 27, 2001.
2. At the time the invention was made, I was employed by Pyrosequencing AB, the assignee of the above-identified application. I continue to be employed by Pyrosequencing AB.
3. I conceived and reduced to practice the subject matter of the invention claimed in the 10/085,774 application prior to March 2000. In particular, I conceived and reduced to practice the method of determining the frequency of an allele in a population of nucleic acid molecules by pooling the nucleic acid molecules, performing primer extension reactions using a primer that binds to a predetermined site in the molecules, and obtaining a pattern of nucleotide incorporation.
4. As evidence of the conception and reduction to practice of the invention prior to March 2000, attached hereto as Exhibit A are copies of seven pages of my laboratory notebook. Each of the dates redacted from the pages of the laboratory notebook is prior to March 1, 2000.

5. The laboratory notebook pages demonstrate that I conceived and reduced to practice the method of the invention to calculate allele frequencies by pooling nucleic acid molecules, performing primer extension reactions using a primer that binds to a predetermined site in the molecules, and obtaining a pattern of nucleotide incorporation. For example, at page 32 of my notebook is the protocol for an experiment to determine the allele frequencies for single nucleotide polymorphisms (SNPs) designated Eu1, Eu4 and Eu7 using primers designated E1s, E4s and E7s. These SNPs and primers are described in the 10/085,774 application at pages 56-57. Page 33 of the laboratory notebook shows the results in the form of nucleotide incorporation versus amount of light released in the Pyrosequencing reaction. Page 34 of the laboratory notebook shows that when peak heights were plotted against allele frequency, a linear relationship was demonstrated.

6. Pages 35-38 of my laboratory notebook attached hereto as Exhibit A demonstrate an experiment in which polymerase chain reaction (PCR) products from 47 individual samples were genotyped for two different SNPs designated Aop 52 and Aop 54 (pages 35 and 36), whereafter they were pooled (page 37), and allele frequency was calculated based on the pattern of nucleotide incorporation (page 38).

7. I further declare that all statements made herein of my own knowledge are true and that all statements made on information or belief are believed to be true, and further that these statements are made with the knowledge that the making of willfully false statements and the like is punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and may jeopardize the validity of any patent issuing thereon.

13 Jan, 2004
Date

Anna Sylvan
Anna Sylvan

Önsketsförsök 1

Last Forward

Eu1 = ACP-240 (A/T) A/T ~~X~~ 158 bp Eu1:1 = A Eu1:2 = T

Eu4 = ACEex15 (A/G) A/G 145 bp Eu4:1 = A Eu4:2 = G

Eu7 = ANP1218 (C/T) G/A 142 bp Eu7:1 = T Eu7:2 = C

spädning (0.1 pmol/μl)

Eu1:1	0.17 pmol/μl	353	+	247	H ₂ O
Eu1:2	0.14	429	+	171	
Eu4:1	0.26	231	+	369	
Eu4:2	0.18	383	+	267	
Eu7:1	0.16	375	+	225	
Eu7:2	0.16	375	+	225	

Önskande spädningsserie gjordes:

Polymer i μl.

AfS

ANP (0.1 100% prov 1 98% prov 1 95% prov 1 90% prov 1 85% prov 1 80% prov 1 75% prov 1 70% prov 1 65% prov 1 60% prov 1 55% prov 1 50% prov 1 45% prov 1 40% prov 1 35% prov 1 30% prov 1

mol/μl	50	49	47,5	45	42,5	40	37,5	35	32,5	30	27,5	25	22,5	20	17,5	15
Eu1:1	0	1	2,5	5	7,5	10	12,5	15	17,5	20	22,5	25	27,5	30	32,5	35
Eu1:2	50	49	47,5	45	42,5	40	37,5	35	32,5	30	27,5	25	22,5	20	17,5	15
Eu4:1	0	1	2,5	5	7,5	10	12,5	15	17,5	20	22,5	25	27,5	30	32,5	35
Eu4:2	50	49	47,5	45	42,5	40	37,5	35	32,5	30	27,5	25	22,5	20	17,5	15
Eu7:1	0	1	2,5	5	7,5	10	12,5	15	17,5	20	22,5	25	27,5	30	32,5	35
Eu7:2	50	49	47,5	45	42,5	40	37,5	35	32,5	30	27,5	25	22,5	20	17,5	15

25% prov 1 20% prov 1 15% prov 1 10% prov 1 5% prov 1 2% prov 1 0% prov 1

12,5	10	7,5	5	2,5	1	0
37,5	40	42,5	45	47,5	49	50
12,5	10	7,5	5	2,5	1	0
37,5	40	42,5	45	47,5	49	50
12,5	10	7,5	5	2,5	1	0
37,5	40	42,5	45	47,5	49	50

til varje brunn/prov blandning till sätter 17,5 μl (10 μg/μl)

magnetlurar. Insättning 15 min, 65°C, 1400 RPM.

Neutralisering i 0.5 M NaOH (ca. 1 min)

vattn i 1x annealing buffert.

3 pmol selvansprimer (E1s, E4s resp. E7s) i 40

μl annealingbuffert. Annealing 80°C, 2 min

elvanskit: 0,1 0003 Kassett: Marknad 1 (andra köringen)

annument: serie 1

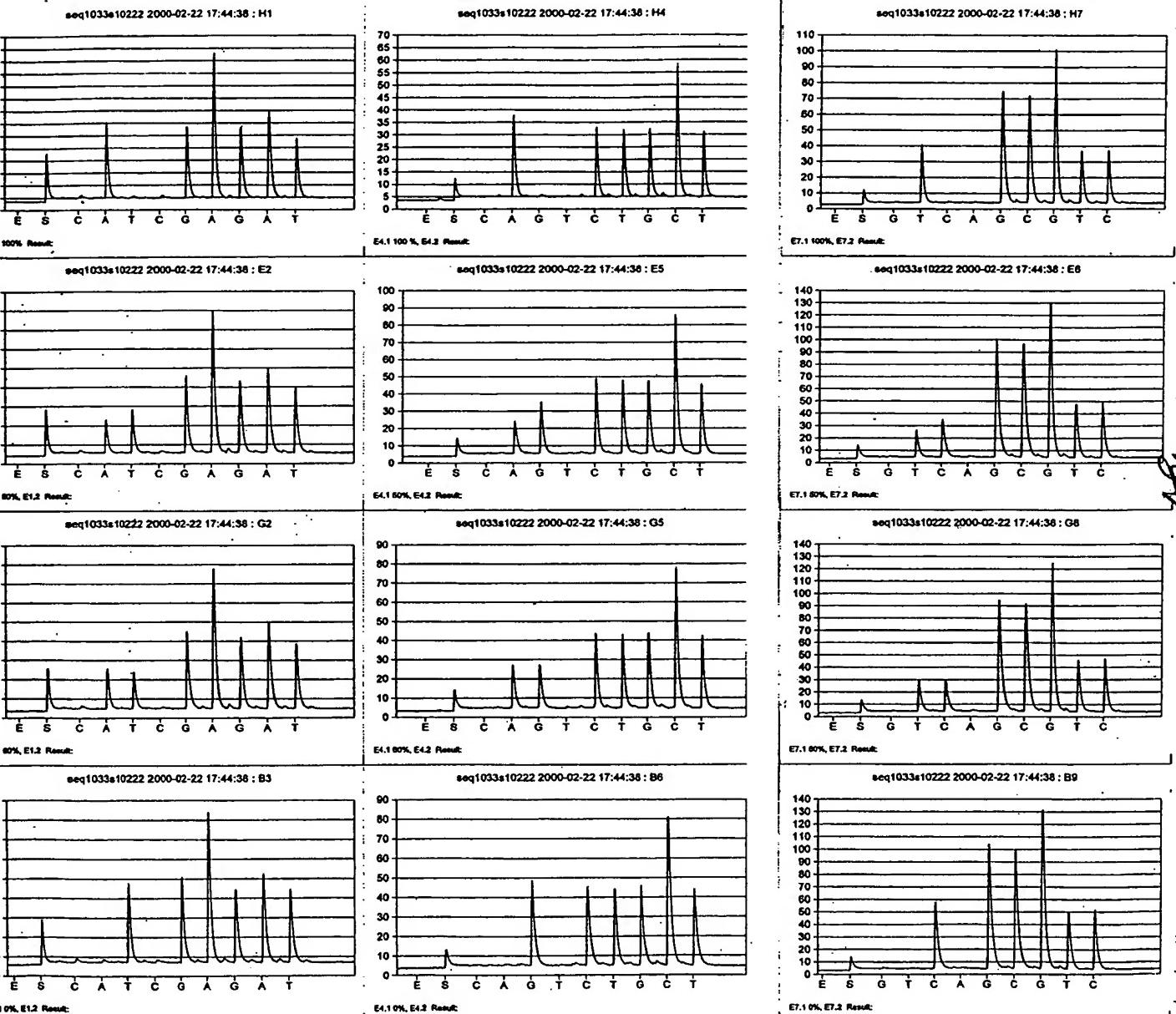
Utmann: seq103B\$10222

Forts →

Böts. från sid 32

Resultat: Det ser mycket lovande ut!

Dock var inte de 2 homozygot prövorna jämnstarka. Försöket bör göras om med kompletterade spädningar.



Ursprungskoncentrationerna för E1:2, E4:2 och E7:2

Kompletteras ens. följande - E1:2 $600 \cdot 0.138 = 0.193$

E4:2 $600 \cdot 0.15 = 0.27$

E7:2 $600 \cdot 0.144 = 0.23$

325 Read and Understood By *[Signature]*

P. - S. 1

Känslighetsförsök 2

Upprening av försöket på sid 32-33 med kompletterade PCR-koncentrationer för Eu1:2, Eu4:2 och Eu7:2.

Eu1:1	0.17 pmol / μl
Eu1:2	0.19
Eu4:1	0.26
Eu4:2	0.27
Eu7:1	0.16
Eu7:2	0.23

spädning (till 0.1 pmol/μl)	
35.3 μl prov	+ 247 μl H ₂ O
3.1	289
2.31	369
2.22	378
3.75	225
2.61	339

Samma spädningsserie gjordes som på sid 32.

17.5 μl magnetkuler (10 μg/μl) per reaktion tillsettes direkt (utan tråd!) Inbindning 15 min, 65°C, 1400 RPM
Denaturering ca 1 min, 0.5 M NaOH
1 tråd i 1x Anneal buff. Annealing, 40 μl 1x AB
med 15 pmol primer. 80°C, 2 min. (Selv.primer E15, E415 o E75)

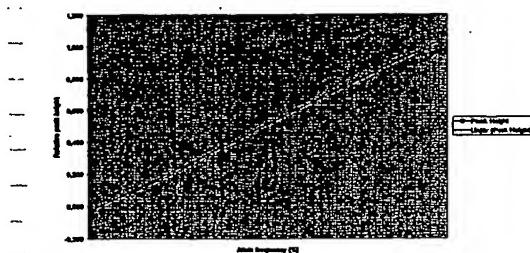
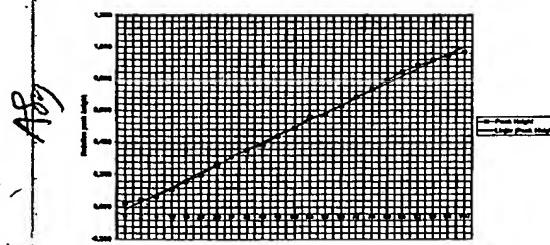
Selvenslit: 010003

Filnamn: seq1034s10223

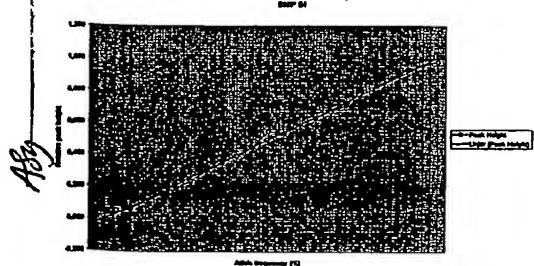
Instrument: Serie 1

Kassett: Marknad 1 (3:e körningen) SNP method ver. 1.0

Resultat: Lysande! Relativa topphöjder (homo1/(homo1+homo2)) mot allelfrekvensen ger linjärt samband!



← 065° rotering
← unormalisering
← beräknat
← Excel-sedan
← data relativa
(... 95, 98, 100)



← Disp. fel för punkteten 50.50% gav ett inget användande mätvärde.

AstraZeneca SNP 52 o 54

Syfte: Att testa mundpröver från AstraZeneca (Hässle) på PCR produkter som erhållits från munnen. SNP:s Aop52 och Aop54 för 247 pröver + PCR nörlor.

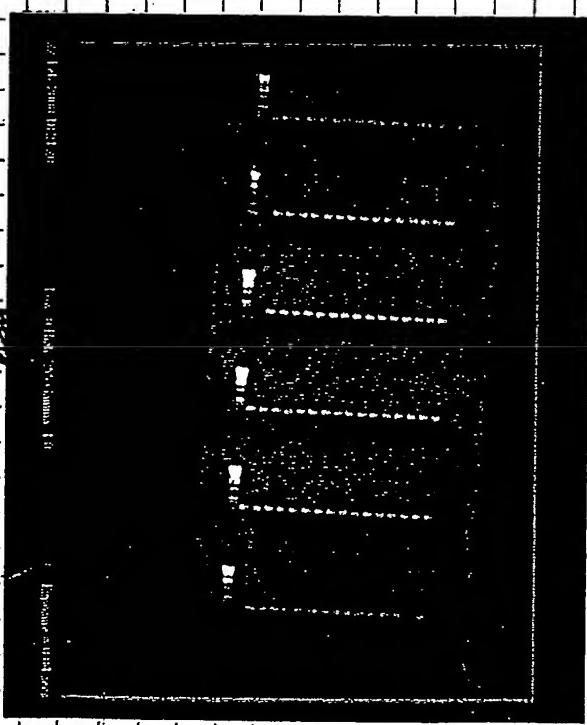
Tyrosaq 00-02-02

	1	2	3	4	5	6	7	8	9	10	11	12
A	522	158	398	668	617	842	522	156	398	668	617	842
B	860	521	40	742	678	851	860	521	49	742	679	851
C	745	321	248	1139	819	639	745	321	246	1139	813	639
D	467	1168	450	847	932	1140	467	1168	450	847	932	1140
E	592	426	390	708	841	164	592	426	390	708	841	164
F	599	1041	397	440	855	940	599	1041	397	440	855	940
G	449	104	271	659	892	889	449	104	271	659	892	889
H	348	245	463	375	908 neg kont.	348	245	463	375	908 neg kont.		

Aop52

Aop54

PCR-mix	x 50	primer.par	PCR program
10x buffer	10	500	95 C 5 min
25 mM Mg	12	600	95 C 30 sec
2.5 mM dNTP	8	400	94 C 45 sec
primer 10 pmol/l	2	100	72 C 1 min
primer 10 pmol/l	2	100	72 C 5 min
Amp Taq Gold	0.4	20	8 C forever
Templat 10 ng/ml	2	100	
vatten	63.6	3180	
	100	5000	



25 µl PCR produkt + 9 µl magnet-
klor (10 µg/µl) (oträttade klor)
direkt från buren) + 16 µl 2×BW
(⇒ totalvolyms 50 µl). Inbindning
15 min, 65°C, 1400 RPM.

Denaturering ca. 1 min i 0.5 M

NaOH. 1 träll i 1×AB

Annealing 80°C, 2 min;
45 µl AB med 15 pmol primer.

Reagenskit: 010003

Instrument: Serie 1

SNP method ver. 1.0

Kassett: Marknad 2 (Första lörringen)

Ports →

Filnamn: seg1035 s10224

Read and Understood By

Anna Sylvan
Sanna Wiktor

Signed

Signed

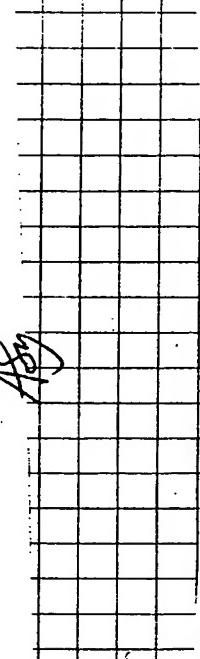
Börts från sid 35

Resultat: Fina kurvor o signaler! Samtliga pröver
genotyperade med hög kvalitet!

Genotyper erhållna med TagMan

TYP	pol 1	pol 2
522	2	2
500	2	2
745	2	2
525	1 and 2	1 and 2
509	1 and 2	1 and 2
540	1 and 2	1 and 2
545	2	2
156	1 and 2	1 and 2
521	1 and 2	1 and 2
321	1 and 2	1 and 2
165	2	2
1241	2	2
104	2	2
345	1 and 2	1 and 2
386	2	2
48	1 and 2	1 and 2
345	1 and 2	1 and 2
505	1 and 2	1 and 2
500	1 and 2	1 and 2
367	2	2
271	2	2
453	2	2
805	1 and 2	1 and 2
742	2	2
1128	2	2
527	2	2
708	2	2
440	1 and 2	1 and 2
650	2	2
975	2	2
617	1 and 2	1 and 2
571	2	2
513	1 and 2	1 and 2
532	1 and 2	1 and 2
841	1 and 2	1 and 2
853	2	2
822	2	2
808	1 and 2	1 and 2
842	1 and 2	1 and 2
571	2	2
636	1	1
1140	1	1
184	2	1 and 2
940	2	2
809	1	1

SCQ1.1
abcd = A
abcd = C
abcd = G
abcd = T



Hög

Genotyper m. Pyro
(seq1085 si0224)

Resultat för Acp52

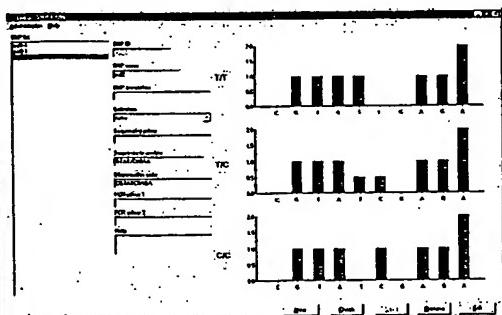
A1:	522/GG
A2:	158/AG
A3:	398/GG
A4:	398/GG
A5:	617/AG
A6:	843/AQ
B1:	860/GG
B2:	621/AG
B3:	494/AG
B4:	742/GG
B5:	679/GG
B6:	679/GG
C1:	742/GG
C2:	321/AG
C3:	246/AQ
C4:	113/GG
C5:	613/AG
C6:	639/AA
D1:	742/GG
D2:	158/AG
D3:	450/AQ
D4:	847/GG
D5:	932/AG
D6:	1140/AA
E1:	562/AG
E2:	426/GG
E3:	390/GG
E4:	742/GG
E5:	841/AG
E6:	164/GG
F1:	509/AG
F2:	1041/GG
F3:	397/GG
F4:	440/AQ
F5:	125/AA
F6:	840/GG
G1:	449/AG
G2:	104/GG
G3:	271/GG
G4:	656/GG
G5:	892/GG
G6:	859/AA
H1:	245/AQ
H2:	453/AG
H3:	375/GG
H4:	908/AG
H5:	nolla

Resultat för Acp54

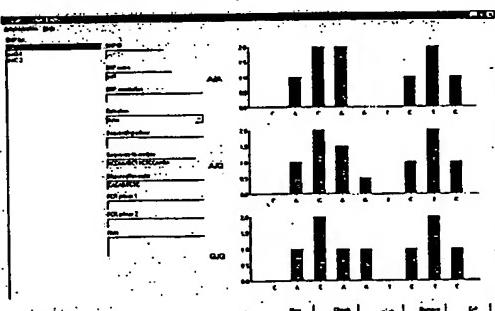
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A8:	158/T/C
A9:	398/T/T
A10:	668/T/C
A11:	617/T/C
A12:	843/L
B7:	860/T/T
B8:	621/T/C
B9:	494/T/C
B10:	742/T/T
B11:	679/T/T
B12:	851/T/T
C7:	742/T/T
C8:	321/T/C
C9:	246/T/C
C10:	1139/T/T
C11:	813/T/C
C12:	639/C/C
D7:	497/T/T
D8:	168/T/C
D9:	450/T/C
D10:	847/T/T
D11:	932/T/C
D12:	1140/C/C
E7:	892/T/C
E8:	426/T/T
E9:	360/T/C
E10:	703/T/T
E11:	841/T/C
E12:	164/T/C
F7:	809/T/C
F8:	1041/T/T
F9:	397/T/T
F10:	440/T/C
F11:	851/T/T
F12:	945/T/C
G7:	449/T/C
G8:	104/T/T
G9:	271/T/T
G10:	656/T/T
G11:	852/T/T
G12:	889/C/C
H7:	346/T/T
H8:	453/T/T
H9:	375/T/T
H10:	908/T/C
H11:	908/T/C
H12:	nolla/T/T

Hög

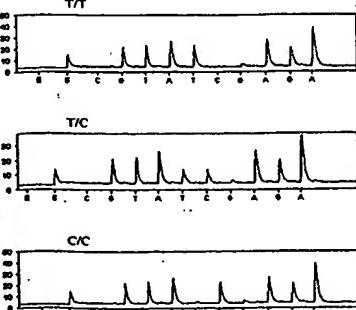
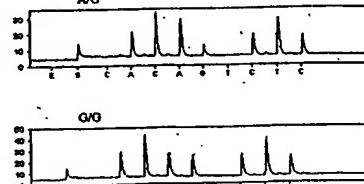
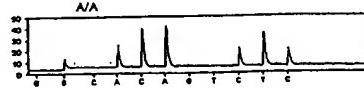
Resultaten överensstämmer väl! (100%)



Hög



Hög



Anna Sylvan

Signed

Read and Understood by

Jonas Wiktor

Signed

Allelfrekvens i poolad population

Syfte: Att poola 47 olika pröver och i en enda pyro-körning bestämma populationens allelfrekvens för den testade SNP:n

Använda pröverna/SNP:arna från sid 35 (Aop52 och Aop54)

Allelfrekvenser: Aop52 73,7% G, 26,6% A

Aop54 72,3% T 27,7% C

Aop52: 5 µl av vardera pool blandades ihop (\Rightarrow tot vol. 235 µl)

Tillsats av $5 \times 17,5 \mu\text{l}$ ($10 \mu\text{g}/\mu\text{l}$) kuler + $5 \times 32,5 \mu\text{l}$ 2xBW.

Blandning genom vortex. Utpyrkning av $100 \mu\text{l}$ i 4 rör o $85 \mu\text{l}$ i det sista.

Aop54: 6 µl av vardera PCR prod. blandas ($\Rightarrow 282 \mu\text{l}$) $250 \mu\text{l}$ av detta blandades med $5 \times 17,5 \mu\text{l}$ kuler + $5 \times 32,5 \mu\text{l}$ 2xBW+buffert. Vortex.

Utpyrkning av $100 \mu\text{l}$ i 5 rör.

Inbindning Aop52: 15 min, 65°C , 900 RPM + 15 min, 65°C , 1400 RPM

Aop54: 15 min, 65°C , 1400 RPM

Demakuring ca. 1 min i $0,5 \text{ M NaOH}$

Trätt i $1 \times \text{AB}$. ~~Annealing~~ till $15 \mu\text{mol}$ primer i $45 \mu\text{l}$ annealing buffert. 80°C i 2 min.

Selvexuskit: 000003

SNP Method Ver 1.0

Instrument: Serie1

Filnamn: Seq1086S10225

fortsättning \rightarrow

Anna Sylvan

Read and Understood By

Johan Wiktor

Forts. från sid 37

Resultat: Mycket bra! Dock, A-topparna betydligt högre än övriga toppar (~20%). Varför? Pga kittert 010003 (som vi vet har stabilitetsproblem)?

Anna Sylvan

Från: Anna Sylvan [anna.sylvan@pyrosequencing.com]
 Skickat: den 26 februari 2000 18:07
 Till: 'Ingemansson, Björn'; 'Ekström, Björn'; 'Nilshans, Helena'; 'Winge, Märten'
 Åmne: Allelfrekvensbestämning

Hej,

Här kommer lite nya trevliga resultat. Jag har gjort ett första försök med allelfrekvensbestämning i en poolad provpopulation (47 individer) för 2 olika SNPs.

För värda SNP gjordes följande: Till poolningen användes 6 ul PCRprodukt från vardera prov. Sette sedan 5 st replikat å 50 ul av poolen (för att få höga signaler). Propprep med förenklat protokoll.

*I replikat 1 för SNP 2 har endast 35ul av poolen använts vilket leder till ngt lägre total signalnivå i denna.

SNP 1: Enkel T/C polymorf med jämn toppböjd för heterozygoter (50:50). Allelfrekvens i den använda populationen: 72.3% T, 27.7%C

Allelfrekvensen i poolade proven beräknades enligt: %C = $\frac{\text{toppböjd}_c}{(\text{toppböjd}_G + \text{toppböjd}_c)} * 100$

Resultat: Lysande överensstämelse med förväntad allelfrekvens!

Replikat	SNP1	Toppböjd	%C
Rep1	T	25,73	27,72
	C	9,87	
Rep2	T	27,37	27,67
	C	10,47	
Rep3	T	25,88	28,11
	C	10,12	
Rep4	T	25,28	27,81
	C	9,74	
Rep5	T	22,38	27,31
	C	8,41	
Average		27,7	

SNP 2: Betydligt svårare test. A/G polymorf som kommer efter ett A i sekvensen => A/A 2A:0G, A/G 1.5A:0.5G, G/G 1A:1G. Heterozygoten är dessutom något skev (ingen A-toppskorrering görs i PyroAnalyzer) med synbar allelfrekvens 43%G, 57% A istället för 50:50% i heterozygota prover. Allelfrekvens i den använda provpoolen: 73.4% G, 26.6% A

Allelfrekvensen i poolade proven beräknades först rakt av enligt: %G = $\frac{2 * \text{toppböjd}_G}{(\text{toppböjd}_G + \text{toppböjd}_A)} * 100$

$$\%A = (\text{toppböjd}_A -$$

$$\text{toppböjd}_G) / (\text{toppböjd}_G + \text{toppböjd}_A) * 100$$

Korr 1: Om man antar att heterozygoten är skev enbart pga för höga A-toppar kan följande korrigering göras (0.83 har jag räknat fram utifrån toppböjden hos likta heterozygoter för att twiga %G till 50% för desse):

$$\%G \text{ corr.1} = 2 * \text{toppböjd}_G / (\text{toppböjd}_G + 0.83 * \text{toppböjd}_A) * 100$$

Korr. 2: Om man istället antar att A-topparna generellt har samma höjd som övriga toppar och att skevheten snarare beror på verklig skevhet i PCR-amplifieringen av de två alellerna (vilket jag tror är ett ganska ovanligt fenomen) så vore följande korrigering mer lämplig:

$$\%G \text{ corr.1} = 2 * \text{toppböjd}_G / (\text{toppböjd}_G + \text{toppböjd}_A) * 100$$

Resultat: Korrigering enligt alternativ 1, dvs. generell reducering av A-toppar utifrån heterozygoternas värden, ger lysande överensstämelse med den förväntade allelfrekvensen i populationen!

	SNP 2	Toppböjd	%G	%G corr.1	%G corr.2
Rep 1	A	29,24	65,19	73,63	75,47
	G	14,14			
Rep 2	A	41,96	66,20	74,69	76,63
	G	20,76			
Rep 3	A	42,11	64,60	73,00	74,78
	G	20,09			
Rep 4	A	44,29	64,62	73,02	74,80
	G	21,14			
Rep 5	A	41,11	64,59	72,99	74,77
	G	19,61			
Average		65,0	73,5	75,3	

$$0.92 \rightarrow 1.02$$

$$0.43 \rightarrow 0.50$$

Hoppas att ni kan följa mina beräkningar –annars är det bara att höra av sig.

Hälsningar Anna

Read and Understood By

Signed

Anna Sylvan

Jacob Skott

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